



# Appraisal of Changes in Tumor Volume After Neoadjuvant Systemic Therapy for Hepatocellular Carcinoma (HCC)



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## Abstract

**Objective:** Hepatocellular carcinoma (HCC) is the most common primary tumor of the liver, and presents a critical public health concern worldwide. Neoadjuvant systemic therapy may be suggested for management of HCC. The rationale behind neoadjuvant systemic treatment may include reduction of the disease burden before administration of subsequent treatments. Neoadjuvant systemic treatment may also prevent widespread dissemination of the disease. Nevertheless, there may also be controversies regarding neoadjuvant systemic treatments such as the risk of delayed local treatments. Selected groups of patients with HCC may benefit from neoadjuvant systemic treatment. In this study, we assessed tumor volume changes after neoadjuvant systemic therapy for HCC.

**Materials and methods:** In the context of this study, we aimed at assessing tumor volume changes after neoadjuvant systemic therapy for HCC. To investigate this critical issue, patients with HCC having available imaging data as part of initial workup were studied. All included patients received upfront neoadjuvant systemic treatment. We have performed a comparative analysis for tumor volumes at diagnostic CT scans of the patients and after neoadjuvant systemic treatment. Tumor volume changes following neoadjuvant systemic treatment have been documented for comparative assessment and analysis.

**Results:** As the primary outcome of this current study, we found a mean decrease of 21% in tumor volumes after neoadjuvant systemic treatment for patients with HCC.

**Conclusion:** Our results may have implications for increased adoption of neoadjuvant therapeutic strategies for HCC management, however, further studies may be warranted to shed light on this hot topic.

**Keywords:** Hepatocellular carcinoma (HCC); Radiation therapy (RT); Neoadjuvant systemic treatment

## Introduction

Hepatocellular carcinoma (HCC) is the most common primary tumor of the liver, and presents a critical public health concern worldwide [1-5]. Considerably, both the disease itself and therapeutic strategies utilized for management of HCC may deteriorate quality of life of affected patients. For the time being, optimal management of HCC may be achieved by sophisticated surgical interventions, radiation therapy (RT), systemic agents, and transplantation [2-5]. From the prospect of RT, several forms of irradiation may be used, and contemporary technologies such as intensity modulation, stereotactic RT, and adaptive RT techniques may lead to better radiotherapeutic outcomes. While

using higher irradiation doses may lead to improved disease control results, toxicity profile of radiation delivery should be considered to maintain patients' quality of life and avoid radiation induced liver disease (RILD). As a matter of fact, recent years have witnessed several advances in technology which contributed to improved radiotherapeutic results. Automatic segmentation techniques, Image Guided RT (IGRT), molecular imaging methods, Intensity Modulated RT (IMRT), stereotactic RT, and adaptive RT (ART) have been introduced for improving treatment efficacy [6-43]. In the context of cancer management, optimal treatment results may only be achieved through close collaboration among related disciplines. From this point of view, multidisciplinary

tumor boards clearly contribute to collaboration among surgical oncologists, radiation oncologists, and medical oncologists by providing an excellent platform for discussing about patient, tumor, and treatment characteristics along with contemplated outcomes of proposed therapeutic approaches. Neoadjuvant systemic therapy may be suggested for management of HCC [2-5]. The rationale behind neoadjuvant systemic treatment may include reduction of the disease burden before administration of subsequent treatments. Neoadjuvant systemic treatment may also prevent widespread dissemination of the disease. Nevertheless, there may also be controversies regarding neoadjuvant systemic treatments such as the risk of delayed local treatments. Selected groups of patients with HCC may benefit from neoadjuvant systemic treatment [2-5]. In this study, we assessed tumor volume changes after neoadjuvant systemic therapy for HCC.

### Materials and Methods

For decades, Department of Radiation Oncology at Gulhane Medical Faculty, University of Health Sciences serves as a tertiary cancer center for patients from Turkey and abroad. A variety of benign and malignant tumors are irradiated here by use of modernized equipment and sophisticated RT strategies including IGRT, IMRT, ART, stereotactic RT, automatic segmentation techniques, and molecular imaging methods [6-43]. In the context of this study, we aimed at assessing tumor volume changes after neoadjuvant systemic therapy for HCC. To investigate this critical issue, patients with HCC having available imaging data as part of initial workup were studied. All included patients received upfront neoadjuvant systemic treatment. We have performed a comparative analysis for tumor volumes at diagnostic CT scans of the patients and after neoadjuvant systemic treatment. Tumor volume changes following neoadjuvant systemic treatment have been documented for comparative assessment and analysis.

### Results

This original research article was intended for investigation of tumor volume changes after neoadjuvant systemic therapy for HCC. All included patients were individually assessed by a multidisciplinary team of experts from surgical oncology, medical oncology, and radiation oncology before management. Patients with HCC having available imaging data as part of initial workup were included. Selected patients initially received upfront neoadjuvant systemic therapy. We made a comparative analysis for tumor volumes at diagnostic CT scan of the patients and after neoadjuvant systemic treatment. Tumor volume changes after neoadjuvant systemic treatment were documented for comparative analysis. As the primary outcome of this current study, we found a mean decrease of 21% in tumor volumes after neoadjuvant systemic treatment for patients with HCC.

### Discussion

HCC accounts for the majority of primary liver tumors, and presents a public health concern around the globe [1-5]. As a

matter of fact, both the disease itself and therapeutic strategies utilized for management of HCC may deteriorate quality of life of affected patients. Currently, optimal management of HCC may be achieved by sophisticated surgical interventions, RT, systemic agents, and transplantation [2-5]. From the perspective of RT, several forms of irradiation may be used, and sophisticated radiotherapeutic approaches such as intensity modulation, stereotactic RT, and adaptive RT techniques may result in improved treatment results. While using higher irradiation doses may lead to improved disease control results, toxicity profile of radiation delivery should also be considered to maintain patients' quality of life and avoid RILD. Admittedly, recent years have witnessed critical advances in technology which contributed to improved RT results. Automatic segmentation techniques, IMRT, IGRT, molecular imaging methods, stereotactic RT, and ART have been introduced for improving treatment results [6-43]. In the context of cancer management, it should be borne in mind that optimal therapeutic outcomes might only be acquired through close collaboration among related disciplines. From this point of view, multidisciplinary tumor boards may contribute to collaboration among surgical oncologists, radiation oncologists, and medical oncologists by providing an excellent platform for discussing about patient, tumor, and treatment characteristics along with contemplated outcomes of proposed therapeutic approaches. Neoadjuvant systemic therapy may be suggested for management of HCC [2-5]. The rationale behind neoadjuvant systemic treatment may include reduction of the disease burden before administration of subsequent treatments. Neoadjuvant systemic treatment may also prevent widespread dissemination of the disease. Nevertheless, there may also be controversies regarding neoadjuvant systemic treatments such as the risk of delayed local treatments. Selected groups of patients with HCC may benefit from neoadjuvant systemic treatment [2-5]. In this study, we assessed tumor volume changes after neoadjuvant systemic therapy for HCC. This original research article was intended for investigation of tumor volume changes after neoadjuvant systemic therapy for HCC. All included patients were individually assessed by a multidisciplinary team of experts from surgical oncology, medical oncology, and radiation oncology before management. Patients with HCC having available imaging data as part of initial workup were included. Selected patients initially received upfront neoadjuvant systemic therapy. We made a comparative analysis for tumor volumes at diagnostic CT scan of the patients and after neoadjuvant systemic treatment. Tumor volume changes after neoadjuvant systemic treatment were documented for comparative analysis. As the primary outcome of this current study, we found a mean decrease of 21% in tumor volumes after neoadjuvant systemic treatment for patients with HCC. Our results may have implications for increased adoption of neoadjuvant therapeutic strategies for HCC management, however, further studies may be warranted to shed light on this hot topic.

## Conflict of Interest

There are no conflicts of interest and no acknowledgements.

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